Current tips on the management of canine urinary tract infections

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Urinary tract infection (UTI) refers to microbial colonization of any portion of the urinary system that is normally sterile. The distal urethra is not sterile, it has a normal flora (1). UTIs are often caused by bacterial organisms that are part of the microflora of the intestinal tract (2). Bacterial UTI is said to occur in about 14% of all dogs at some time during their life (3) and the infection rate was higher in females than in males as shown at necropsy. The infection rate was highest in dogs younger than 2 years and older than 6 reaching 50% in females older than 10 years (4).

Infection can occur either in the upper or the lower urinary tract or in both sites at once. It might sometimes be difficult to detect the location of an infection. Furthermore, an infection in one part of the urinary tract increases the likelihood of another part of the urinary tract becoming infected as well (1). Most UTIs are the result of ascending migration of pathogens from the distal urogenital tract to the sterile part (5). UTI develops when the host's defenses are overwhelmed by microbes. Normal defenses include washout of pathogens by normal micturition with complete emptying of the bladder, mucosal layer with glycosaminoglycanes, epithelial desquamation, functional properties like ureteral peristalsis and local and systemic immune competence. Furthermore urine itself has antimicrobial properties that may play a role in limiting bacterial growth and include high osmolality, urine constituents with antimicrobial effect (e.g. high concentration of urea, organic acids, Tamm-Horsfall mucoproteins or low-molecular weight carbohydrates) and extreme values of urine pH (6, 7). Not all microbes are pathogenic; bacteria need special virulence factors to initiate UTI. UTI is usually caused by one single bacterial species. Predominant bacterial species in a multicenter study from Europe were one study were E. coli (60%), Proteus spp. (12%), Staphylococcus spp. (11%), Enterococcus spp. (5%), Streptococcus spp. (4%), Klebsiella spp. (2%), and Enterobacter spp. (1%) (8).

Typical clinical signs of lower UTI are stranguria, pollakiuria, and hematuria. As the bladder and the proximal urethra are so close together, infection in one is very likely to affect the other. Asymptomatic bacteriuria is also common in animals and it is difficult to localize it in either the upper or the lower urinary tract (9). It is often seen in animals with compromised host defense, such as those with glucocorticoid excess or diabetes mellitus.

The gold standard for diagnosis of UTI is urine culture. Examination of the urine sediment provides some help in the identification of UTI. More than four white blood cells per 400X field in unstained sediment under a cover slip together with bacteria identified during the same examination are indicatives. However the presence of pyuria represents any inflammation and is not synonymous with UTI. The absence of pyuria does not rule out UTI.

Cystocentesis is the preferred method of urine collection for culture, because lower genitourinary tract contamination is avoided.

Antimicrobial treatment for urinary tract infections is subject to discussions. Antimicrobial resistance of bacteria causing urinary tract infection increase and the use of antibiotics in animals is or will likely be restricted. Administration of antimicrobial agents should be based on susceptibility testing. Empirical treatment should be avoided if possible. Overtreatment of urinary tract infection was found to be common (10). Current guidelines suggest amoxicillin and trimethoprim-sulfonamide as first line antibiotics (11). However, local susceptibility patterns should be considered if empirical treatment is necessary.
Uncomplicated UTIs are those in which no underlying problem is found and they should be treated for about 7 days. However, no studies have been done determining the exact length of treatment. Complicated UTIs are infections with an underlying anatomic, functional or metabolic condition preventing the clearance of an infection (9). The occurrence of three or more UTIs within 12 months is also considered a complicated UTI (11). In these animals, treatment for a longer period than the

routine 7 days may be indicated (up to 4 weeks). In these cases, it may also be indicated to test the urine after the first week of treatment to evaluate the response to therapy, and after the end of treatment to make sure that no more bacteria are present.
Treatment of UTI is usually successful and nearly 75% of infections remain single episodes (12). Recurrent UTI might be caused either by the same organism which was isolated before treatment (refractory UTI or relapsing UTI) or by a different organism (reinfection). In both cases, further work is required to identify the underlying causes. If predisposing disorders are not addressed, control of UTI will be poor.

Specifically for recurrent UTIs but also for uncomplicated UTIs alternative therapies are discussed. Cranberry and D-Mannose can inhibit the adhesion of bacteria to the bladder wall. Their efficacy has not been proven in dogs. Probiotics are considered to reestablish a normal vaginal microbiome, but again proof is lacking. Immunomodulation by killed uropathogen bacteria essential oils or acupuncture are other treatment options discussed. In addition, colonization of the bladder with a human asymptomatic bacteriuria E. coli strain is considered as possible treatment option (13).

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